Paper Titles

Paper Title:
Economic Exploitation of Gravel in Place of Granite in Concrete Production

Abstract

The paper investigated the application of gravel as partial economic replacement of granite in concrete production. Concrete was produced using granite/gravel combination in varying percentages of 90/10, 80/20, 70/30, 60/40, 50/50, 40/60, 30/70, 20/80 and 10/90. Concrete made from 100 % granite and 100 % gravel served controls while other constituents of concrete were kept constant. Two different mix ratios of 1:2:4 and 1:3:6 were employed. Sieve analysis was carried out on the aggregates, while slump and compaction factor tests were carried out on fresh concrete. Compressive strength tests were performed on hardened concrete. Specimens were produced using 150 mm cubes for compressive tests. The reliable percentage of granite/gravel combination from compressive strength view point 60/40 with a value of 21.15 N/mm^2 for mix ratios 1:2:4 and 70/30 with 15.17 N/mm^2 for 1:3:6 mix ratio at 28 days. Satisfying respectively the 20 N/mm^2 and 15.17 N/mm^2 minimum requirement of BS 8110: 1997.There were costs saving of 4 % per unit volume of concrete production for both 1:2:4 and 1:3:6 respectively. Empirical evidence from the regression analysis revealed that higher composition of gravel significantly improves the concrete consistency properties while greater proportions of granite do significantly enhance comprehensive strength.

Info
Periodical
Materials Science Forum (Volume 866)
Main Theme
2016 the First International Conference on Civil Engineering and Materials Science

Chapter
Chapter 1: Analysis Properties and Production of Cements and Concretes

Edited by
Zhihua Guo, C. W. Lim, Kyoung Sun Moon, George C. Manos

Pages 73-77

DOI 10.4028/www.scientific.net/MSF.866.73
Citation
G. O. Bamigboye, A. N. Ede, A. A. Raheem, O. M. Olofinnade, U. Okorie, "Economic Exploitation of Gravel in Place of Granite in Concrete Production", Materials Science Forum, Vol. 866, pp. 73-77, 2016
Online since
August 2016

Authors
Gideon O. Bamigboye *, Anthony N. Ede, Ayinde A. Raheem, Oluwarotimi M. Olofinnade, Uche Okorie
Keywords
Coarse Aggregate, Compressive Strength, Concrete, Regression Analysis

* Corresponding Author

Materials Science Forum
ISSN: 1662-9752, Vol. 866, pp 73-77
doi:10.4028/www.scientific.net/MSF.866.73

Submitted: 2016-05-06
Accepted: 2016-05-10
Online: 2016-08-11

Economic Exploitation of Gravel in Place of Granite in Concrete Production

G.O. Bamigboye[1, a*], A.N. Ede[1,b], A.A. Raheem[2,c], O.M. Olofinnade[1,d] and U. Okorie[3,e]

[1]Department of Civil Engineering, Covenant University, Ota, Nigeria

[2]Department of Civil Engineering, Ladoke Akintola University of Technology, Ogbomoso, Nigeria

[3]Department of Economics, Covenant University, Ota, Nigeria

[a*]gideon.bamigboye@covenantuniversity.edu.ng, [b]anthony.ede@covenantuniversity.edu.ng
[c]raheemayinde@yahoo.com, [d]rotimi.olofinnade@covenantuniversity.edu.ng,
[e]ucheson4excel@yahoo.com

Keywords: Concrete, Coarse Aggregates, Compressive Strength, Regression Analysis.

Abstract. The paper investigated the application of gravel as partial economic replacement of granite in concrete production. Concrete was produced using granite/gravel combination in varying percentages of 90/10, 80/20, 70/30, 60/40, 50/50, 40/60, 30/70, 20/80 and 10/90. Concrete made from 100 % granite and 100 % gravel served controls while other constituents of concrete were kept constant. Two different mix ratios of 1:2:4 and 1:3:6 were employed. Sieve analysis was carried out on the aggregates, while slump and compaction factor tests were carried out on fresh concrete. Compressive strength tests were performed on hardened concrete. Specimens were produced using 150 mm cubes for compressive tests. The reliable percentage of granite/gravel combination from compressive strength view point 60/40 with a value of 21.15 N/mm^2 for mix ratios 1:2:4 and 70/30 with 15.17 N/mm^2 for 1:3:6 mix ratio at 28 days. Satisfying respectively the 20 N/mm^2 and 15.17 N/mm^2 minimum requirement of BS 8110: 1997.There were costs saving of 4 % per unit volume of concrete production for both 1:2:4 and 1:3:6 respectively. Empirical evidence from the regression analysis revealed that higher composition of gravel significantly improves the concrete consistency properties while greater proportions of granite do significantly enhance comprehensive strength.

Introduction

Quality of construction materials impact greatly on the integrity of built structures. Stake holders have been advocating for the use of locally-available materials as to reduce the cost of infrastructural systems and thereby making buildings affordable to the middle and low class residents. Hence, any advocacy for adopting a new material or for blending known materials should be tested to assess the technical and economic viability of adopting them for structural applications. Concrete is a composite material made with Portland cement, aggregates, water and various types of admixtures [1]. Concrete has very good compressive strength and resistance to fire [2]. Aggregates generally occupy 60 % to 75 % of the concrete and strongly influence the strength of freshly mixed concrete and play a major role in the hardened strength of the concrete [3]. Close to half of the coarse aggregate used in Portland cement concrete in North America are gravels while most of the remainder is crushed stones [4]. Due to the quantity of aggregates required for a typical civil engineering application, the cost and availability of the aggregates are important when selecting an aggregate source [5, 6]. Granite is relatively strong and more expensive, while gravel is much more affordable. Previous studies on coarse aggregates have been predominantly on 100% granite and 100% gravel without combining both and examine the economic aspect of the combination. The economic condition makes gravel more attractive for building development. Gravels result from the natural disintegration of rocks and are usually rounded and as such require less amount of cement paste. This saves about (4-5) % cement paste [7]. Generally, granite is more expensive than gravel because it has to undergo more processes like blasting of the rocks before it can be used by the final

References
Cited by
Related Articles